icoPESA

2023 the 7th International Conference on

POWER ENERGY SYSTEMS AND APPLICATIONS

2023 年第七届电力能源系统与应用国际会议

Nanjing, China | February 24-26, 2023

中国，南京 | 2023 年 2 月 24-26 日

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Welcome Message

前言

On behalf of the conference committees, we are pleased to welcome you to 2023 the 7th International Conference on Power Energy Systems and Applications (ICoPESA), which will be held in Nanjing, China on February 24-26, 2023, co-sponsored by Nanjing University of Aeronautics and Astronautics and Singapore Institute of Electronics, hosted by Nanjing University of Aeronautics and Astronautics. We would like to invite you to participate in this international conference, to share your recent research outcome as well as taking this opportunity to meet academia, scientists and researchers from different parts of the world.

This event provides a unique opportunity for international scholars, researchers and practitioners working in a wide variety of scientific areas with a common interest in power energy systems and applications to get the theoretical grounding, practical knowledge, and personal contacts needed to build a long term, profitable and sustainable connection among each other.

It's our great pleasure to invite 12 prestigious experts and professors to deliver the latest information in their respective expertise areas, they are:
Prof. Xinbo Ruan, Nanjing University of Aeronautics and Astronautics, China
Prof. Loi Lei Lai, Guangdong University of Technology, China
Prof. Guan-Jun Zhang, Xi'an Jiaotong University, China
Prof. Fushuan Wen, Zhejiang University, China
Prof. Donglian Qi, Zhejiang University, China
Prof. Jun Jiang, Nanjing University of Aeronautics and Astronautics, China
Prof. Jianning Yin, Xi'an University of Technology, China
Prof. Soteris A. Kalogirou, Cyprus University of Technology, Cyprus
Prof. Gianfranco Chicco, Politecnico di Torino, Italy
Prof. Xuzhen Huang, Nanjing University of Aeronautics and Astronautics, China
Prof. Haoran Zhao, Shandong University, China
Prof. Xin Dai, Chongqing University, China

We'd like to express our sincere gratitude to everyone who has contributed to ICoPESA 2023 as its success could have only been achieved through a team effort. Additionally, our special thanks go to all the conference committees, for putting the conference together; as well as to all the technical committee members and reviewers for their excellent work in reviewing the papers and their other academic support efforts. Finally, we are particularly grateful to all the authors and presenters of the papers as well as all the attendees for their contributions to this wonderful conference.

Finally, we hope you have a fruitful and memorable experience at ICoPESA 2023!

With Warmest Regards,
Conference Organizing Committees

Conference Schedule

会议日程

February 24th (Friday, GMT+8) | 2 月 24 日（周五）

Onsite Meeting 南京线下会议签到		
10:00-17:00	Registration & Collecting Conference Material | 1 楼酒店大厅	
Online Meeting Test 线上会议测试		
Zoom Link	https://us02web.zoom.us/j/84094281163	https://us02web.zoom.us/j/83131556021
10:00-12:00	Special Session 1C, 1D, 1E	Special Session 1F, 1G, 1H
14:00-16:00	Session 2B, Session 3B, Workshop	Session 1, Session 2, Session 3
17:00-18:00	Conference Speakers, Session Chairs	Best Paper Competitions

February 25th (Saturday, GMT+8) | 2 月 25 日（周六）

Room	Tang Shan Hall (2nd Floor) | 2 楼汤山厅	
Zoom Link	https://us02web.zoom.us/j/84094281163	
Speech Host	Jun Jiang, Nanjing University of Aeronautics and Astronautics, China	
9:20-9:30	Opening Remarks	Prof. Chaohai Zhang, Nanjing University of Aeronautics and Astronautics, China
9:30-10:00	Keynote	Prof. Xinbo Ruan, Nanjing University of Aeronautics and Astronautics, China
10:00-10:30	Keynote	Prof. Loi Lei Lai, Guangdong University of Technology, China
10:30-11:00	Group Photo & Coffee Break	
11:00-11:30	Keynote	Prof. Guan-Jun Zhang, Xi'an Jiaotong University, China
11:30-12:00	Keynote	Prof. Fushuan Wen, Zhejiang University, China
12:00-13:30	Lunch	
Speech Host	Jin Li, Tianjin University, China	
13:20-13:50	Keynote	Prof. Donglian Qi, Zhejiang University, China
13:50-14:20	Keynote	Prof. Jun Jiang, Nanjing University of Aeronautics and Astronautics, China
14:20-14:50	Keynote	Prof. Jianning Yin, Xi'an University of Technology, China
14:50-15:00	Coffee Break	
Speech Host	Vladimir Terzija, Skolkovo Institute of Science and Technology, Russia	
15:00-15:30	Keynote	Prof. Soteris A. Kalogirou, Cyprus University of Technology, Cyprus
15:30-16:00	Keynote	Prof. Gianfranco Chicco, Politecnico di Torino, Italy
16:00-16:10	Coffee Break	
16:10-18:30	Best Student Paper Competition A SA0451, SA1831, SA1892, SA0421, SA1014, SA0843, SA1971	
Online Meeting 线上会议		
Zoom Link	https://us02web.zoom.us/j/84094281163	https://us02web.zoom.us/j/83131556021
16:10-18:10	Best Student Paper Competition B SA004, SA1671, SA1601, SA1571, SA006, SA1503	Best Industrial Paper Competition SA1364, SA1462, SA0291, SA2091, SA0625
18:10-20:00	Conference Dinner	

February 26th (Sunday, GMT+8) | 2 月 26 日（周日）

Room	Dong Shan Hall (2nd Floor) | 2 楼东山厅	
Zoom Link	https://us02web.zoom.us/j/84094281163	
Speech Host	Linlin Zhong, Southeast University, China	
8:30-9:00	Keynote	Prof. Xuzhen Huang, Nanjing University of Aeronautics and Astronautics, China
9:00-9:30	Keynote	Prof. Haoran Zhao, Shandong University, China
9:30-10:00	Keynote	Prof. Xin Dai, Chongqing University, China
10:00-10:0	Break	

Room	Dong Shan Hall (2nd Floor) | 2 楼东山厅	Mo Lin Hall (2nd Floor) | 2 楼秣陵厅
10:10-11:40	Special Session 1A SA1661, SA1611, SA0431, SA0813, SA1214, SA1621	Special Session 2A SA1004, SA1314, SA0391, SA0833, SA1901, SA1194
12:00-13:30	Lunch & Break	
13:30-15:00	Special Session 1B SA1044, SA1104, SA1711, SA1801, SA1352, SA1395	Special Session 3A SA0933, SA0304, SA0721, SA0363, SA1591, SA1174
15:00-15:30	Coffee Break	
15:30-16:30	Poster Session SA0903, SA0441, SA2021, SA0463, SA1452, SA0661, SA1335, SA1405	
17:30-19:00	Conference Dinner	

	Online Meeting 线上会议			
Zoom Link	https://us02web.zoom.us/j/83131556021	https://us02web.zoom.us/j/89249120204	https://us02web.zoom.us/j/82537439224	https://us02web.zoom.us/j/84037960352
10:10-12:25	Special Session 1C SA0681, SA1244, SA1254, SA1961, SA0913, SA0953, SA1741, SA1325, SA1523	Special Session 1D SA2061, SA1553, SA1422, SA2104, SA1731, SA2051, SA1533, SA1821, SA007	Special Session 2B SA0783, SA1124, SA0691, SA0943, SA0635, SA0793, SA0493, SA1294, SA2081	Special Session 3B SA0773, SA2011, SA1751, SA1771, SA1701, SA0873, SA1094, SA0351
12:00-13:30	Break			
13:30-15:30	Special Session 1E SA1432, SA002, SA0513, SA1641, SA1442, SA1761, SA0994, SA003, SA1054	Special Session 1F SA1921, SA1114, SA1412, SA1134, SA0853, SA0751, SA0731, SA1931, SA1513	Session 1 SA1084, SA2041, SA1991, SA1274, SA1064, SA0483, SA0411, SA005	Session 2 SA0503, SA1564, SA1483, SA1721, SA301, SA0655, SA0923, SA0984
15:30-16:00	Break			
16:00-18:15	Special Session 1G SA1865, SA1164, SA0963, SA1473, SA1875, SA1024, SA0645, SA1691, SA1681	Special Session 1H SA0863, SA0761, SA0701, SA2001, SA001, SA0535, SA0555, SA0883, SA0374	Workshop SA0401, SA1631, SA0711, SA0565, SA1651, SA1781, SA1811, SA10021	Session 3 SA4001, SA0823, SA1034, SA2031, SA4003, SA0973, SA1885, SA0525, SA1791
Zoom Link	https://us02web.zoom.us/j/84094281163			
18:30-18:50	Closing Ceremony & Awards | 闭幕式 & 会议颁奖（线上） Host: Vladimir Terzija, Skolkovo Institute of Science and Technology, Russia			

Session Information
分会场信息

Best Student Paper Competition A
New Power Electronic System and Key Application Technology
新型电力电子系统及关键应用技术

Best Student Paper Competition B
New Intelligent Power Equipment: Design, Control and Development
新型智能电力设备：设计，控制与开发

Best Industrial Paper Competition
Research and Development Trend of Integrated Power System with High Renewable Energy Penetration
高可能再生能源渗透率集成电力系统现状研究及发展趋势

Special Session 1
Advanced Modeling, Optimization and Control Technologies for Power Systems with High Renewable Energy Penetration
高可再生能源渗透电力系统的先进建模、优化和控制技术

Special Session 2
Insulation Testing, Modeling and Simulation of Power Equipment
电力设备绝缘测试、建模与仿真

Special Session 3
The Integration Technology of "Load-storage-transformation-network-detection" Integrated System for Electrical Equipment
电气设备“负载-存储-转换-网络-检测”集成系统集成技术

Workshop
Real-Time Digital Simulation and Hardware-in-the-loop Testing of Power and Energy Systems
电力和能源系统的实时数字仿真和硬件在环测试

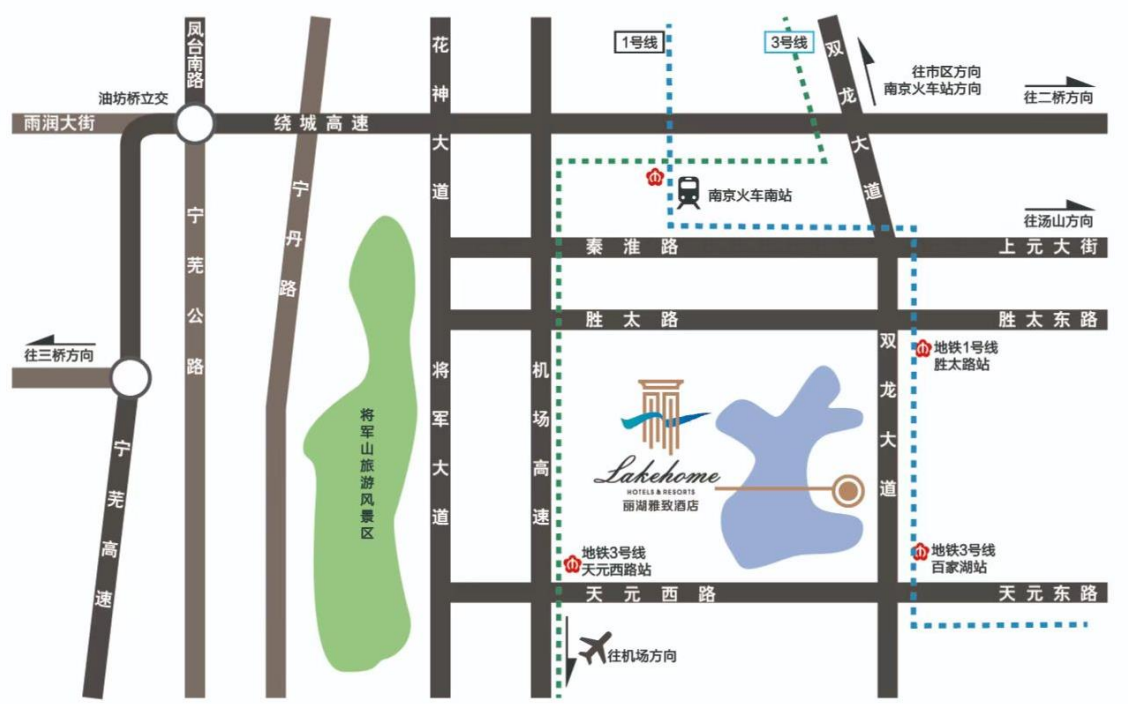
Session 1
Fault Diagnosis and Condition Monitoring in Intelligent Power System
智能电力系统中的故障诊断与状态监测

Session 2
New Power System Configuration and Management
新型电力系统配置与管理

Session 3
System Control and Data Analysis in Power Systems
电力系统中的系统控制与数据分析

Local Information

会场须知



丽湖雅致会展中心酒店

地址：中国南京市江宁区双龙大道 1528 号（近凤凰广场）

签到地点 | 酒店 1 楼大厅

酒店总机订房电话：025-52108111

订房：卢经理，电话：15190476658 | 高级房：380（无早）；440（单早）

现场参会的嘉宾请报会议名称“2023 年第七届电力能源系统与应用国际会议”，享受住宿优惠。

会场注意事项

1. 注意安全防范，妥善保管好个人财物、资料，休息或离开房间时务必锁好房门。
2. 请各位嘉宾根据日程安排按顺序报告，并关注临时通知。
3. 会场多媒体设备由会务组统一提供，报告者可通过拷入 U 盘的方式，提前备好演讲文稿电子版（PPT/PDF）用于试场、报告等；每位演讲者报告时长包括演讲和提问交流时间。
4. 本次会议凭借胸卡进入会场，凭餐券用餐，请随身携带。
5. 遵守会场秩序，会议开始前请将手机调至静音，保持会场安静。

Online Guideline
线上会议须知

Test before Formal Meeting 会前设备测试

Date: 24th February
Before the formal meeting, presenters shall join the test room to ensure everything is good.

Time Zone 时区

Beijing Time (GMT+8)
You're suggested to set up the time on your laptop in advance.

Equipment & Environment Needed 报告环境须知

- A laptop with stable internet connection and camera
- Headphones
- A quiet place
- Proper lighting and background

Software 会议软件

ZOOM Download:

- https://zoom.us/download
- For Chinese Users: https://zoom.com.cn/download

Presentation Tips 报告指南

- Competition Timing: a maximum of **20 minutes** in total, including 3 minutes for Q&A.
- Parallel Presentation Timing: a maximum of **15 minutes** in total, including 3 minutes for Q&A.
- It is suggested that the presenter email a copy of his/her video presentation to the conference email as a backup in case any technical problem occurs.

Conference Recording 会议录制

- The whole conference will be recorded. We appreciate you proper behavior and appearance.
- The recording will be used for conference program and paper publication requirements. The video recording will be destroyed after the conference and it cannot be distributed to or shared with anyone else, and it shall not be used for commercial nor illegal purpose. It will only be recorded by the staff and presenters have no rights to record.

Organizing Committees

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Chunjuan Jia, Shandong University, China
Jinyu Wang, Nanyang Technological University, Singapore
Diego Bellan, Politecnico di Milano, Italy
Zhengshuo Li, Southeast University, China
Qilong Huang, Nanjing University of Science and Technology, China
Fang Liu, Hefei University of Technology, China
Ping Ji, Wanjiang University of Technology, China

Keynote Speaker
专家报告

Prof. Xinbo Ruan
Nanjing University of Aeronautics and Astronautics, China
IEEE Fellow
阮新波，南京航空航天大学教授，长江学者/国家杰青

Beijing Time:	9:30-10:00, Feb. 25th, 2023	Onsite Room	Tang Shan Hall (2nd Floor) | 2 楼汤山厅
ZOOM ID:	840 9428 1163	ZOOM Link:	https://us02web.zoom.us/j/84094281163

Second Harmonic Current Reduction Techniques for Two-Stage Single-Phase Power Converters

两级式单相功率变换器的二次谐波电流抑制技术

BIO Xinbo Ruan (Fellow, IEEE) received the B.S. and Ph.D. degrees in electrical engineering from the Nanjing University of Aeronautics and Astronautics (NUAA), Nanjing, China, in 1991 and 1996, respectively. In 1996, he joined the College of Automation Engineering, NUAA, where he became a Professor in 2002. From 2008 to 2011, he was also with the College of Electrical and Electronic Engineering, Huazhong University of Science and Technology, Wuhan, China. He is the author or coauthor of 13 books and more than 300 technical papers published in journals and conferences. His main research interests include soft-switching power electronic converters, power electronic system integration, and renewable energy generation system.,Dr. Ruan is currently the Vice-President of China Power Supply Society. He is currently an Editor for IEEE Journal of Emerging and Selected Topics on Power Electronics and an Associate Editor for IEEE Transactions on Power Electronics, IEEE Transactions on Circuits and Systems II, and IEEE Open Journal of Industrialelectronics Society.

ABSTRACT In the two-stage single-phase power factor correction ac–dc converter, the input power pulsates at twice the line frequency; while in the two-stage single-phase dc–ac inverter, the output power pulsates at twice the output frequency. Meanwhile, in the two kinds of single-phase converters, the dc port holds constant power. Consequently, the pulsating power will result in second harmonic current (SHC) in the ac–dc converter and dc–ac inverter. The SHC will propagate into the dc-dc converter, the input dc voltage source or the dc load, leading to the degradation of the conversion efficiency of the dc-dc converter, the reduction of the energy conversion efficiency of the input dc voltage source, and shortened lifetime of the input dc voltage source or the dc load. To overcome these drawbacks, it is of necessity to suppress the SHC in the dc-dc converter, the dc voltage source or the dc load.

This report will firstly reveal the generating and propagating mechanism of the SHC in the two-stage single-phase converters. Then, a series of control schemes to suppress the SHC in the dc-dc converter while improving the dynamic response of the system are proposed. Besides, the electrolytic capacitor-less SHC compensator will also be presented, with which the undesired electrolytic capacitor can be removed so as to prolong the lifetime of the overall system.

Keynote Speaker
专家报告

Prof. Loi Lei Lai
Guangdong University of Technology, China
Editor-in-Chief of the IEEE Smart Cities Newsletter
IEEE Life Fellow, IET Fellow
赖来利，广东工业大学教授

Beijing Time:	10:00-10:30, Feb. 25th, 2023	Onsite Room	Tang Shan Hall (2nd Floor) | 2 楼汤山厅
ZOOM ID:	840 9428 1163	ZOOM Link:	https://us02web.zoom.us/j/84094281163

Smart Energy for Applications in Smart Cities

BIO Loi Lei Lai is University Distinguished Professor, Guangdong University of Technology, Guangzhou China. He was Pao Yue Kong Chair Professor with Zhejiang University, Hangzhou China, and Chair of Electrical Engineering with City, University of London. His current research areas are in smart cities and smart energy. He was awarded an IEEE Third Millennium Medal, the IEEE Power and Energy Society (IEEE/PES) UKRI Power Chapter Outstanding Engineer Award in 2000, a special award from City, University of London in 2005 and is its honorary graduate, the IEEE/PES Energy Development and Power Generation Committee Prize Paper in 2006 and 2009, IEEE Systems, Man, and Cybernetics Society (IEEE/SMCS) Outstanding Contribution Award in 2013 and 2014, Most Active Technical Committee Award in 2016, and his research team received a Best Paper Award in the IEEE International Smart Cities Conference in 2020 and the 2022 Meritorious Service Award from IEEE/SMCS for "meritorious and significant service to IEEE SMC Society technical activities and standards development". He is Editor-in-Chief of the IEEE Smart Cities Newsletter, and Chair of the IEEE/SMCS Standards Committee. He was Director of Research and Development Center, State Grid Energy Research Institute, China; IEEE/SMCS Vice President for Membership and Student Activities; a Fellow Committee Evaluator for the IEEE Industrial Electronics Society and IEEE/PES Lifetime Achievement Award Assessment Committee Member. He is an IET Fellow and IEEE Life Fellow.

ABSTRACT Smart energy is the process of adopting intelligent devices such as smart sensors for increasing energy efficiency. It focuses on large-scale sustainable renewable energy sources that promote greater eco-friendliness while reducing costs and increasing reliability. To accommodate for ever-increasing data, the application of smart devices to human lifestyles and services, secure computer systems that meet the needs of smart cities are essential. This includes new architecture, concepts, algorithms in machine learning and artificial intelligence. Smart energy networks require fast and intelligent decisions, which will only be possible with the help of intelligent and complex computer systems. Urban energy networks are becoming increasingly linked and integrated. This is crucial for cities aiming to achieve energy efficiency and environmental sustainability.

In addition to this, there are ongoing advances in renewables and energy storage systems, along with innovative information, communication and control technologies. Thus, there are opportunities and challenges emerging in the design, planning, and operation of more distributed energy system architectures with significant amount of local energy consumptions. The enabling technologies and methodologies aimed at

addressing complex challenges include decentralized computing, self-organizing sensor networks, proactive control, and holistic computing frameworks.

There are various challenges facing on power system operation and planning due to increased penetration of many new technologies of diversified properties. On one hand, system operators and many other participants have to deal with increased uncertainties and risks involved in daily operation and planning activities. On the other hand, applications of many new metering and measurement devices, capable of closely monitoring and sensing grid operation in real-time, result in over whelming amount of measurement data of high precision and resolution. By far, how to make the best use of the massive data remains quite a challenging task facing power system researchers and practitioners. The availability of the high-quality data could potentially facilitate risk hedging and decision making in system operation and planning, of which the prerequisite calls for innovative informatics approaches that are intelligent, data driven, and capable of handling various complex problems.

This keynote covers few important topics ‘derived’ from smart energy such as transportation, health, and standards development. To achieve net-zero emissions by 2050/2060, preserve biodiversity and mitigate global warming, people need to have a better and more sustainable world. Smart energy will play a key role in a carbon-neutral society. Major environmental, economic and technological challenges such as climate change, economic restructuring, pressure on public finances, digitalization of the retail and entertainment industries, and growth of urban and ageing populations have generated huge interest for cities to be run differently and smartly. Some current international research and development activities will be reported, and future directions will be discussed.

Keynote Speaker
专家报告

Prof. Guan-Jun Zhang
Xi'an Jiaotong University, China
张冠军，西安交通大学教授，国家杰青

Beijing Time:	11:00-11:30, Feb. 25th, 2023	Onsite Room	Tang Shan Hall (2nd Floor) | 2 楼汤山厅
ZOOM ID:	840 9428 1163	ZOOM Link:	https://us02web.zoom.us/j/84094281163

Partial Discharge Diagnostics: from Single Power Equipment to Whole Substation
局部放电诊断：从单台电力设备到整个变电站

BIO Guan-Jun Zhang was born in Weifang, Shandong, China in 1970. He received B.S., M.S. and Ph.D. degrees in electrical engineering from Xi'an Jiaotong University (XJTU), Xi'an, China, in 1991, 1994 and 2001, respectively. He is currently a leading-scholar professor at School of Electrical Engineering, XJTU, China, and the director of Center for Advanced High Voltage and Plasma Technology. His main interests cover high voltage insulation and discharge characteristics, fault diagnosis and condition maintenance for power equipment, discharge plasmas and multi-disciplinary applications, etc. He has been visiting researcher at Tokyo Institute of Technology (Japan), visiting scientist at Plasma Physics Laboratory, Princeton University (USA), JSPS fellow at Saitama University (Japan), and visiting professor at University of Southampton (UK). He has published 300 papers and held 30+ patents. Prof. Zhang received Distinguished Young Scholar of NSFC, IEEE ISDEIV Chatterton Young Investigator, Fok Ying Tong Research Award for University Young Teachers, and National Top 100 Excellent Doctoral Dissertation Award of China, etc.

ABSTRACT Partial discharge (PD) measurement and interpretation is regarded as an effective approach for assessing the condition of high-voltage power equipment such as transformer, gas insulated switchgear (GIS) and others, and avoiding equipment failure due to insulation defects. In this speech, considering the situation of PD defect sources existing inside a transformer or GIS, 35kV and 110kV actual transformers and 252kV GIS experimental platforms embedded with multiple PD defects are constructed. Different PD signals of pulse current, ultra-high-frequency (UHF) electromagnetic radiation and ultrasonic wave, are collected, and complicated algorithms for multi-source signal separation, positioning and pattern identification are investigated. Moreover, the UHF detection technology is extended to the movable UHF antenna array, which is used for the PD measurement of all power equipment in a whole substation. Compared with traditional PD diagnostics of power equipment single by single, the movable strategy suitable for whole substation greatly promotes the PD detection efficiency and also significantly reduces the cost of PD system configuration. Besides quantities of laboratory experiments and algorithm optimization, on-site application cases prove the availability of PD diagnostics in this speech, and two kinds of diagnostic strategies behave a good complementary relation.

Keynote Speaker
专家报告

Prof. Fushuan Wen
Zhejiang University, China
IEEE Fellow
文福拴，浙江大学教授

Beijing Time:	11:30-12:00, Feb. 25th, 2023	Onsite Room	Tang Shan Hall (2nd Floor) | 2 楼汤山厅
ZOOM ID:	840 9428 1163	ZOOM Link:	https://us02web.zoom.us/j/84094281163

Resilience-enhancement Oriented Distribution System Design
以增强弹性为导向的配电系统设计

BIO Professor Fushuan Wen joined the faculty of Zhejiang University in 1991, and has been a full professor and the director of the Institute of Power Economics and Information since 1997, and the director of Zhejiang University-Insigma Joint Research Center for Smart Grids since 2010. He has also been a full professor in the Hainan Institute, Zhjiang University, Sanya, China, since 2022. He has been undertaking various teaching, research and visiting appointments in Singapore, Hong Kong, Australia, Brunei, Estonia, Denmark. He has published 200+ SCI-indexed papers, 670+ EI-indexed papers, and 770+ Scopus-indexed papers. His publications have been cited for 17500+ times. He has completed and is undertaking more than 200 grants and projects. He received many awards, including the most prestigious National Natural Science Award of China. He has been listed in "Most Cited Chinese Researchers" in seven consecutive years since 2015 by Elsevier, and is the author of one of the China's 100 Most Influential Domestic Academic Papers in 2016. He is the editor-in-chief of Energy Conversion and Economics (SPERI, IET, Wiley), the deputy editor-in-chief of Journal of Automation of Electric Power Systems, a subject editor in power system economics of IET Generation, Transmission and Distribution. He was elected to IEEE Fellow for contributions to fault diagnosis in power grids.

ABSTRACT In this speech, a new design method is presented for a distribution system to reinforce its resilience against high-impact and low-probability events. The line hardening and the deployment of remote-controlled switches are employed as two powerful measures for resilience enhancement. The hardening of tie lines and the deployment of bilateral tie switches are particularly emphasized as important parts of the resilience-enhancement oriented design. A progressive detection mechanism is devised to estimate the potential propagation of outages and identify surviving nodes outside of the minimum outage area after intentional islanding. The presented resilience-enhanced distribution system design problem is formulated as a mixed-integer linear programming (MILP) model, and the nested column-and-constraint generation algorithm is customized to solve the MILP model. Numerical results are presented to demonstrate the effectiveness and the superiority of the proposed resilience-enhancement oriented design method for distribution systems.

Keynote Speaker
专家报告

Prof. Donglian Qi
Zhejiang University, China
齐冬莲，浙江大学教授

Beijing Time:	13:20-13:50, Feb. 25th, 2023	Onsite Room	Tang Shan Hall (2nd Floor) | 2 楼汤山厅
ZOOM ID:	840 9428 1163	ZOOM Link:	https://us02web.zoom.us/j/84094281163

High Efficiency Distributed Coordination and Cyber-Physical Security Control Strategy of Microgrid CPS

微电网 CPS 分布式高效协同与信息物理安全控制方法

BIO Donglian Qi received her Ph.D. degree in control theory and control engineering from Zhejiang University, Hangzhou, China, in March 2002. Since then, she has been with the College of Electrical Engineering, Zhejiang University where she is currently a Professor. Her current research interests include the basic theory and application of cyber physical power system (CPPS), digital image processing, artificial intelligence, and electric operation and maintenance robots. She is an Editor for the Clean Energy, the IET Energy Conversion and Economics, and the Journal of Robotics, Networking and Artificial Life.

ABSTRACT Microgrid CPS, which can integrate a great many of distributed renewable generators, is regarded as a promising solution to the challenge of increasing demand and environmental concerns. However, the uncertainties of renewable energies and interactions between power grid and cyber system can bring about diverse emerging operation and control issues. Besides, the deep involvement of cyber systems also makes microgrid CPSs more vulnerable to cyber-physical security risks, such as time delay, cyber failures, malicious attacks, etc. Therefore, how to achieve efficient coordinated control of distributed renewable generators and increase cyber-physical security of microgrid CPS is of great importance. In this lecture, some trigger-based distributed control algorithms for the secondary control of microgrids will be shared. With these trigger-based control, the communication and computation burden of the distributed control system can be greatly reduced, and hence the system efficiency can be improved. Furthermore, some attack-resilient distributed secondary control will be introduced as well. Protected by these methods, the system can still maintain stability event when being attacked, and hence the cyber-physical security of microgrid CPS can be significantly improved.

Keynote Speaker
专家报告

Prof. Jun Jiang
Nanjing University of Aeronautics and Astronautics
江军，南京航空航天大学研究员

Beijing Time:	13:50-14:20, Feb. 25th, 2023	Onsite Room	Tang Shan Hall (2nd Floor) | 2 楼汤山厅
ZOOM ID:	840 9428 1163	ZOOM Link:	https://us02web.zoom.us/j/84094281163

Optical Sensing Techniques for High Voltage Power Apparatus
高压电力设备的光学传感技术研究

BIO Jun Jiang is a Professor with the Jiangsu Key Laboratory of New Energy Generation and Power Conversion, Nanjing University of Aeronautics and Astronautics, China. He received the B.E. degree in electrical engineering and automation from China Agricultural University (CAU) in 2011 and PhD degree in high voltage and electrical insulation from North China Electric Power University (NCEPU) in 2016. During 2019-2020, He worked as an Academic Visitor/Honorary Staff in Department of Electrical & Electronic Engineering, School of Engineering, The University of Manchester, UK.

At present, he is an IEEE Senior Member, CIGRE member, also a representative for CIGRE JWG D1/A2.77 (Liquid Tests for Electrical Equipment). He has published more than 60 peer-reviewed papers including more than 50 journal articles. As well, more than 21 patents have been granted. He was granted as Young Researcher Award by International Symposium on High Voltage Engineering (ISH) and Outstanding Reviewers Award by High Voltage.

His research interests are optical fiber sensing, condition monitoring of power apparatus and more-electric-aircraft.

ABSTRACT Transformers are one of the most important equipment in a power grid. Its health index can significantly impact both the reliability and functionality of the power grid. However, partial in-service transformers worldwide have already reached or exceed their design life expectancy. Thus, real-time online monitoring and assessment have been prioritized on the agenda among utilities around the globe to allow for a timely maintenance action and avoid any potential catastrophic failures. Many new detection tools are being investigated continuously by researchers and engineers in the field. In particular, with advances in optical engineering and communications technology, the last few decades have witnessed the emergence and development of a new generation of optical approaches for power apparatus condition monitoring. Since the inherent advantages of fibre optic sensors include lightweight, compatibility, passivity, low attenuation, low power, immunity to electromagnetic interference (EMI), high sensitivity, wide bandwidth and environmental ruggedness. These advantages are utilized to compromise for its high cost and unfamiliarity to the consumer. Therefore, they have become commonly used and applied in high voltage applications.

Keynote Speaker
专家报告

Assoc. Prof. Jianning Yin
Xi'an University of Technology
尹健宁，西安理工大学副教授

Beijing Time:	14:20-14:50, Feb. 25th, 2023	Onsite Room	Tang Shan Hall (2nd Floor) | 2 楼汤山厅
ZOOM ID:	840 9428 1163	ZOOM Link:	https://us02web.zoom.us/j/84094281163

Arc Characteristics and Breaking Technology of Low-Voltage Circuit Breaker for New Energy System

新能源系统用低压断路器电弧特性及开断技术

BIO Jianning Yin (Member, IEEE) received the Ph.D. degree in Electrical Engineering in 2019 from Xi'an Jiaotong University. Currently, he is an Associate Professor with the School of Electrical Engineering, Xi'an University of Technology. His research interests include optimization design and intelligence of high and low voltage circuit breakers, advanced interruption technology for DC circuit breakers, MHD simulation of switching arc, switching arc plasma and its application.

ABSTRACT Under the development trend of global clean energy and environmental protection, the installed capacity of new energy power generation such as wind power and photovoltaic power generation has maintained a rapid growth. At the same time, higher requirements have been put forward for low-voltage circuit breakers that play a protective and control role in the new energy power generation system. In the wind power generation system, the circuit breaker is required to break the short circuit current in a wide frequencies; In the photovoltaic power generation system, the circuit breaker is required to be able to break the DC short circuit current of higher voltage (>1500V), and at the same time, the circuit breaker can be more miniaturized. Based on, the research group has carried out simulation and experimental research on arc characteristics at different frequencies. The research providing theoretical reference for the design of broadband circuit breakers. At the same time, the evolution characteristics of DC arc under high voltage are simulated and studied by the MHD simulation .Based on the simulation, the high-efficiency arc breaking technology is put forward. Through the matching design of structural parameters of arc extinguishing chamber, the arc dynamic characteristics can be coordinated regulation. This break technology has been applied to the design of DC circuit breaker products. The high-voltage DC arc has been successfully interrupted and the miniaturization of circuit breaker products has been realized. By applying this technology, high-performance DC circuit breaker products have been developed and widely used in new energy power generation systems. It effectively serving the healthy development of the new energy power generation in China.

Keynote Speaker
专家报告

Prof. Soteris A. Kalogirou
Cyprus University of Technology, Cyprus
Editor-in-Chief of Renewable Energy and Deputy Editor-in-Chief of Energy
Fellow of the European Academy of Sciences, IEEE Fellow

Beijing Time:	15:00-15:30, Feb. 25th, 2023	Onsite Room	Tang Shan Hall (2nd Floor) | 2 楼汤山厅
ZOOM ID:	840 9428 1163	ZOOM Link:	https://us02web.zoom.us/j/84094281163

Status of Renewable Energy Systems in the World and Prospects

BIO Professor Soteris Kalogirou, D.Sc. is at the Department of Mechanical Engineering and Materials Sciences and Engineering of the Cyprus University of Technology, Limassol, Cyprus. He is currently the Dean of the School of Engineering and Technology. He is a Fellow of the European Academy of Sciences and Founding Member of the Cyprus Academy of Sciences, Letters and Arts. For more than 35 years, he is actively involved in research in the area of solar energy and particularly in flat plate and concentrating collectors, solar water heating, solar steam generating systems, desalination, photovoltaics, geothermal energy and absorption cooling. He has a large number of publications in books, book chapters, international scientific journals and refereed conference proceedings. He is Editor-in-Chief of Renewable Energy and Deputy Editor-in-Chief of Energy, and Editorial Board Member of another twenty journals. He is the editor of the book McEvoy's Handbook of Photovoltaics, published by Academic Press of Elsevier and author of the books Solar Energy Engineering: Processes and Systems, and Thermal Solar Desalination: Methods and Systems, published by Academic Press of Elsevier.

ABSTRACT This presentation examines the current status of renewables in the world. The presentation starts with some facts about climate change, global warming, and the effects of human activities, such as the burning of fossil fuels on the climate problem. It then outlines of the status of renewables in the world, which includes their shares with respect to conventional fuel use for power and for electricity production alone, and their social dimension in terms of jobs created. Then the basic forms of renewables are examined in some detail, which include solar thermal, both for low and high temperature applications, photovoltaics, hydro power, onshore and offshore wind energy systems and biomass/biofuels. In all these the basic technology is presented followed by the current status, the installed capacity in the last decade, which reveals their upward trend, as well as the prospects of the technology and some new research findings.

Keynote Speaker
专家报告

Prof. Gianfranco Chicco
Politecnico di Torino, Italy

Editor-in-Chief of Sustainable Energy, Grids and Networks
IEEE Fellow, Vice-Chair of the IEEE Italy Section

Beijing Time:	15:30-16:00, Feb. 25th, 2023	Onsite Room	Tang Shan Hall (2nd Floor) | 2 楼汤山厅
ZOOM ID:	840 9428 1163	ZOOM Link:	https://us02web.zoom.us/j/84094281163

Effectiveness of the Clustering Methods for The Categorization of The Electrical Demand

BIO Gianfranco Chicco holds a PhD in Electrotechnics Engineering and is a Full Professor of Power and Energy Systems at Politecnico di Torino (POLITO) in Torino, Italy. He is a Fellow of the IEEE and the vice-Chair of the IEEE Italy Section. He received the title of "Doctor Honoris Causa" from the University Politehnica of Bucharest (Romania) and from the Technical University "Gheorghe Asachi" of Iasi (Romania) in 2017 and 2018, respectively. He participated in the various European Projects with POLITO and the Italian Consortium ENSIEL. He is the Editor-in-Chief of the journal Sustainable Energy, Grids and Networks (Elsevier), a Subject Editor of Energy (Elsevier), and an Editor of IEEE Open Access Journal of Power and Energy, IET Renewable Power Generation, and Energies (MDPI). He was the Chair of the International Conferences 55th UPEC (2020), 7th IEEE PES ISGT Europe (2017) and 6th WESC (2006) and is the Chair of the 20th IEEE EUROCON (2023). His research activities include Power System Analysis, Distribution System Analysis and Optimization, Electrical Load Management, Multi-Energy System Flexibility, Data Analytics, and Power Quality.

ABSTRACT Clustering algorithms are typically used for the categorization of the electrical demand. The application of the clustering algorithms is incorporated in a structured approach that includes a pre-clustering phase, the execution of the clustering algorithm, and a post-clustering phase. The pre-clustering phase contains various activities dedicated to the definition of the macro-categories of users, the choice of the representative days, the bad data detection and cleaning, and the choice of the features to be used for clustering, with the corresponding normalization aspects. The choice of the clustering algorithm is a key point that depends on the purpose of clustering (creating uniform groups, or identifying outliers). The post-clustering phase forms the final groups of users and the load profiles associated to these groups, while clustering validity assessment techniques can be applied to check the effectiveness of the clustering results.
The presentation provides a discussion on the main points of the whole structured approach indicated above. A specific focus is set on the role of the expert of the electricity domain in selecting appropriate features, choosing an effective method for clustering analysis, and interpreting the clustering results. A significant point is the different treatment needed for handling residential and non-residential users. For individual residential users, there is a strong dependence of the power curves of the residential demand on many unpredictable aspects linked to the consumers' lifestyle. Because of that, the use of classical metrics such as the Euclidean distance in the clustering algorithms could be ineffective. For non-residential users, the grouping based on the load curves is not connected with the categorization of the activities based on the type of activity. The use of clustering algorithms is then essential to obtain a categorization of the users based on the shape of the electrical demand patterns.

Keynote Speaker
专家报告

Prof. Xuzhen Huang
Nanjing University of Aeronautics and Astronautics, China
黄旭珍，南京航空航天大学教授，国家优青

Beijing Time:	8:30-9:00, Feb. 26th, 2023	Onsite Room	Dong Shan Hall (2nd Floor) | 2 楼东山厅
ZOOM ID:	840 9428 1163	ZOOM Link:	https://us02web.zoom.us/j/84094281163

Key Technology of Multi-Mover Permanent Magnet Linear Motor System
多动子直线电机系统的关键技术

BIO Huang Xuzhen, professor, College of Automation Engineering, Nanjing University of Aeronautics and Astronautics. She graduated from Harbin University of Technology in the major of Electrical Engineering in 2012. She focuses on the research of permanent magnet linear motor system. She was supported by the National Science Fund for Excellent Young Scholars. She has presided over and participated in a number of projects entrusted by enterprises such as the National Natural Science Fund, the National Instrument Development, CASC and AVIC. She has published more than 60 high-level papers and has more than 20 national invention patents.

ABSTRACT Compared with the traditional single-mover linear motor system, the multi-mover permanent magnet synchronous linear motor system has the characteristics of large capacity, modularization, flexibility and intelligence. It is one important part of the material transmission system of the future intelligent production line. Its application will bring revolutionary changes to the automatic production line and greatly improve the efficiency and quality of production and processing. This report mainly introduces relevant key technologies, including: Different topological structures and performance characteristics of multi-mover permanent magnet linear motor system; thrust ripper reduction and optimization of permanent magnet linear motor and arc motor; distributed driver technology and high precision current and speed control; cable-less position detection technology; high-speed data communication and multi-mover coordinated motion control technology. In the report, the prototype system and test results involved in the above technologies will be shown.

Keynote Speaker
专家报告

Prof. Haoran Zhao
Shandong University, China
赵浩然，山东大学教授，电气工程学院副院长

Beijing Time:	9:00-9:30, Feb. 26th, 2023	Onsite Room	Dong Shan Hall (2nd Floor) | 2 楼东山厅
ZOOM ID:	840 9428 1163	ZOOM Link:	https://us02web.zoom.us/j/84094281163

Research and Application of Digital Twin technology in Wind Power
风电数字孪生技术研究及应用

BIO Haoran Zhao is currently a National Distinguished Professor (selected in 2017), doctoral supervisor, Qilu Young Scholar (selected in 2016) and the Deputy Dean of the School of Electrical Engineering of Shandong University. Prof. Zhao received his bachelor, master and Ph.D. degrees from Shandong University (SDU), Technische Universität Berlin (TUB), and Technical University of Denmark (DTU) in 2001, 2010, and 2014, respectively. He got the national scholarship for outstanding overseas students in 2014. He has worked for State Grid Shandong Electric Power Company, Younicos AG of Germany, DIgSILENT of Germany and the Power Energy Center of the Technical University of Denmark. In October 2017, he joined the School of Electrical Engineering of Shandong University full-time. 2019-2020 concurrently served as Deputy Director of the Construction Office of Shandong University Longshan Campus (Chuangxin Port). He is currently a senior member of IEEE, member of CIGRE Working Group C6.C1.33, CIGRE C4.56, and IEC SC Expert of working Group 8A, Vice president of Shandong Energy Research Association, member of Distribution Network Control and Operation Special Committee of Electrical Engineering Society, member of Artificial Intelligence and Electrical Application Special Committee of Electrical Engineering Society, member of Digital Twin Committee of Integrated Energy of Simulation Society, member of Integrated Energy Special Committee of Renewable Energy Society. Prof. Zhao currently serve as the Associate Editor of IEEE Transactions on Sustainable Energy, IET Renewable Power Generation/Journal of Engineering and other international journals, as well as a youth editor for power protection and control, and invited to serve as the Associate Editor of the IEEE Transactions on Energy Conversion special issue, the International Journal of Electrical Power& Energy Systems special issue Editor-in-chief.

ABSTRACT Under the dual carbon goals, wind power will play an essential role in the new energy supply. Wind power's increasing scale and permeability have brought about many urgent problems, including wind power grid connection, wind farm operation, and wind turbine design. Digital twin technology is an effective means to solve these problems. This report proposes a systematic solution for implementing digital twin systems in wind farms. The research content focuses on the core issues such as high-precision modelling, real-time simulation algorithm, virtual-real data fusion, and mining. A real-time wind farm simulation software and hardware platform with independent intellectual property rights are developed on this basis. The research results of this project will be used as an essential tool to assist power grid companies, power generation companies, and wind power equipment manufacturers in realizing large-scale wind power grid connections, wind farm intelligent operation, and full-digital design of wind turbines, which will bring enormous economic and social benefits to the wind power industry and have an extensive application prospect.

Keynote Speaker
专家报告

Prof. Xin Dai

Chongqing University, China

戴欣，重庆大学教授，自动化学院副院长

Beijing Time:	9:30-10:00, Feb. 26th, 2023	Onsite Room	Dong Shan Hall (2nd Floor) | 2 楼东山厅
ZOOM ID:	840 9428 1163	ZOOM Link:	https://us02web.zoom.us/j/84094281163

TBA

BIO He received his Ph.D. degree in control science and engineering from Chongqing University, Chongqing, China, in 2006. He is currently the Professor of the School of Automation, Chongqing University, Chongqing, China, and the Associate Director of National International Research Center of Wireless Power Transfer.

Professor Dai is a leading researcher in Wireless Power Transfer (WPT) and nonlinear control in Power Electronics, significantly contributing to both Wireless Power Transfer theory methods and engineering applications. He is very active as associate editors for top IEEE journals, including IEEE Transactions on Power Electronics, IEEE Transactions on Industrial Electronics, IEEE Transactions on Magnetics. As a scientific leader in the field of systems and control, he has been serving on various national and international technical committees.

Prof. Dai has made original contributions in Wireless Power Transfer technology with real world applications, which can be assessed by his publications (over 100 papers) in prestigious international journals, including IEEE T-IE, IEEE T-PE. He authored/co-authored 2 books in the field of Wireless Power Transfer. He also held 50 patents, some of which have gone through technology transfer with an estimate market value of over $10 million. He has given many keynote talks and invited talks, chaired numerous conferences.

ABSTRACT TBA